



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

2.4.9 CHANNEL DIVERSIONS

REVIEW RESPONSIBILITIES

Primary - ~~Hydrologic & Geotechnical Engineering Branch (HGEB)~~
Mechanical and Civil Engineering Branch (EMEB)

Secondary - None

I. AREAS OF REVIEW

In this section of the applicant's ~~safety analysis report~~
(~~SAR~~)~~site safety assessment for an early site permit application,~~
the geohydrologic design basis is developed to ~~assure~~ ensure that
~~the plant~~ a nuclear power plant or plants of specified type that
might be constructed on the proposed site and essential water
supplies will not be adversely affected by natural stream channel
diversion or that, in such an event, alternate water supplies ~~are~~
~~would be~~ available to safety-related equipment.

The review includes:

1. Historical channel diversions, including cutoffs and subsidence.

2. Regional topographic evidence which suggests that future channel diversion may or may not occur (used in conjunction with evidence of historical diversions).
3. Alternate water sources and operating procedures (coordinate review with that of SAR **safety assessment** Section 2.4.11.6).

II. ACCEPTANCE CRITERIA

Acceptance criteria for this SRP **Standard Review Plan (SRP)** section relate to the following regulations:

1. ~~General Design Criterion 2 (GDC 2) requires that structures, systems, and components important to safety be designed to withstand floods.~~
2. General Design Criterion 44 (GDC 44) requires an ultimate heat sink capable of accepting the plant's heat load of a nuclear power plant or plants of specified type that might be constructed on the proposed site under normal and accident conditions.
3. 10 CFR Parts **52 and** 100 requires that hydrological characteristics be considered in the evaluation of the site.

Section 52.17(a) of 10 CFR Part 52 and Section 100.20(c) of 10 CFR Part 100 require that physical characteristics of the site, including seismology, meteorology, geology, and hydrology, be taken into account to determine the acceptability of a site for a nuclear power reactor.

Channel diversion or realignment, which poses the potential for flooding or adversely affecting the supply of cooling water for a

USNRC STANDARD REVIEW PLAN

~~Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies.~~

~~Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.~~

~~Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.~~

~~Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.~~

nuclear power plant or plants of specified type that might be constructed on the proposed site. is one of the many natural phenomena specified in 10 CFR 100.20(c) that must be considered in designing the plant to accommodate the characteristics of a proposed site.

Meeting this requirement provides a level of assurance that a nuclear power plant or plants of specified type that might be constructed on the proposed site would not be vulnerable to flooding or to loss of cooling water that could be caused by channel diversion resulting from severe natural phenomena.

Note: Though not required at the early site permit stage, the applicant for a combined license (COL) will need to demonstrate compliance with General Design Criterion 2 as it relates to structures, systems, and components important to safety being designed to withstand floods.

To meet the requirements of ~~GDC-2~~, GDC 44, and 10 CFR Parts 52 and 100 as they relate to channel diversions, the following specific criteria are used:

1. A description of the applicability (potential adverse effects) of stream channel diversions is required.
2. Historical diversions and realignments must be discussed.
3. The topography and geology of the basin and its applicability to natural stream channel diversions must be addressed.
4. If applicable, the safety consequences of diversion and the potential for high or low water levels caused by upstream or downstream diversion adversely to affect safety-related facilities, water supply, or ultimate heat sink must be addressed. Regulatory Guide 1.27 provides guidance on acceptable criteria for ultimate heat sinks.

III. REVIEW PROCEDURES

Site-specific publications and maps are reviewed to identify historical channel diversions and to evaluate (by independent conservative calculations and professional judgment) the potential for future diversions. Where an alternate safety-

related cooling water supply is provided, the criteria for **SAR safety assessment** Section 2.4.11.6 apply and are checked for consistency.

The above reviews are performed only when applicable to the site or site region. Some items of review may be done on a generic basis.

IV. EVALUATION FINDINGS

For ~~construction permit (CP)~~ **early site permit** reviews and when applicable, findings will consist of a brief general description of historical channel diversions. If the staff concurs with the applicant that channel diversion is unlikely or that ~~the plant~~ **a plant or plants of specified type that might be constructed on the proposed site would be** ~~is~~ protected from potential flood effects and that alternate essential water supplies meet the criteria of Regulatory Guide 1.27, the findings will so indicate. If the staff evaluation does not support the applicant's contention of channel stability or the effects of channel diversions, flood protection and/or an alternate source of water may be required.

~~For operating license reviews, findings will consist of the same material, updated as required to reflect new information available since preparation of the CP findings.~~

A sample ~~CP-stage~~ **early site permit** statement follows:

~~As set forth above, diversions~~ **Diversions** of the A River are well documented in historical and topographic data. Oxbow lakes, low-lying swamps, and bars and chutes provide eloquent evidence of historical diversion. ~~Others~~ **organizations** are planning further bank protection measures, ~~additional~~ **in addition** to the existing levee system, in the vicinity of the **planned or likely location of the** plant intake structure. However, the diversion of the main channel by degradation/aggradation within the confines of the levee system, or by breaching the west levee during major floods, cannot be discounted. ~~Nonetheless, the~~ **ultimate heat sink (as discussed in safety assessment Section 2.4.11) would not be directly dependent on the river intake.** Therefore, ~~the~~ **The staff concludes that the plant's ultimate heat sink of a nuclear power plant of type specified by the applicant that might be constructed on the proposed site would** ~~will~~ not be endangered by potential channel diversions and thus meets this aspect of GDC 44. ~~This conclusion is based upon the fact that the ultimate heat sink (as discussed in SAR Section 2.4.11) is not directly dependent on the river intake.~~

~~In addition, a nuclear power plant of type specified by the applicant that might be constructed on the proposed site would be well away from the path of any potential diversion of the A River and well above the level of any resultant flood. Therefore, the~~ **The staff concludes that the plant proposed site meets the requirements of GDC 2 10 CFR Parts 52 and 100 with respect to floods caused by channel diversions.** ~~This conclusion is based on the fact that the plant is well away from the path of any potential diversion of the A River and well above the level of any resultant flood.~~

Based upon the above evaluation, ~~we conclude~~ **the staff concludes** that channel diversions present no safety-related hazard to ~~the plant~~ **a nuclear power plant of type specified by the applicant that might be constructed on the proposed site** and that the requirements ~~to~~ **of 10 CFR Parts 52 and 100** relative to channel diversions have been met.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of early site permit applications submitted by applicants pursuant to 10 CFR Part 52 . Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

No specific publications can be cited for general use; however, site-specific publications and maps can be obtained from the United States Geologic Survey, Soil Conservation Service, National Oceanic and Atmospheric Administration, Corps of Engineers, and state and other agencies and organizations, to identify historical and potential future channel diversions.

1. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."
2. 10 CFR Part 50, Appendix A, General Design Criterion 44, "Cooling Water."
3. 10 CFR Part 100, "Reactor Site Criteria."
4. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."
6. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants."

7. 10 CFR Part 52. "Early Site Permits: Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."